SOVIET ACTIVITY AND CAPABILITY IN THE ARCTIC

The following information and accompanying maps are in response to the questions outlined in the Department of Defense request for information regarding Soviet activity and capability in the Arctic.

Items 1 and 2. Although specific data for these two items are not available, information included under the remaining items will partially fulfill these requirements and suggest the extent of the total Soviet Arctic effort.

Item 3. Logistical support for the Soviet drifting stations and research and development installations is provided by a combination of sea and air operations. In 1954 and 1955, materiel was delivered from inland locations to coastal bases and then air lifted to the drifting stations. Aircraft performing these services were under the supervision of Polar Aviation and probably numbered about 100. Since 1955 the bulk of supplies is believed to have been carried to coastal bases by ships over the Northern Sea Route during the summer navigation season and then transferred to the drifting stations by air the following fall and spring. Polar Aviation aircraft have been used almost exclusively for this service; and, because of the pre-airlift deposit of cargoes by sea, the number of aircraft involved in recent years has not been as large as it was during the all-air operations in 1954 and 1955.

Research and development installations are usually located at all major ports along the Northern Sea Route and are supplied by sea during the navigation season. Any research and development expeditions that do not have access to maritime support are supplied by air lifts from larger bases.

Although the research and development operations are sizable, the cost of the logistic support program and the number of aircraft and personnel involved cannot be ascertained. The specific number of ships used to support the drifting stations and research and development installations is not known, but the Chief Directorate of the Northern Sea Route has about 100 ships of various types under its command and the total number and the types of ships that sailed the Northern Sea Route during the 1957 navigation season has been estimated as follows:

435 Soviet cargo ships, including freighters, lighters, tugs, barges, and hydrographic ships

15 Soviet icebreakers

50 non-Communist freighters (carrying lumber from Igarka to Western ports)

62 naval vessels (enroute to the Soviet Far East via the Northern Sea Route)

Item 4. Northern Sea Route operations, under optimum conditions, are possible in the terminal areas from early July to mid-October; and complete passage of the route can be made from late July to mid-September (see Map 1). Severe pack-ice conditions occur at Proliv Vil'kitskogo and Proliv Longa and may hold up convoys and upset shipping schedules. Nearly half (15) of the Soviet Union's 35 icebreakers are stationed in the Arctic to assist shipping operations. The icebreakers include 6 diesel-electric ships of the icebreaker-cargo type, among them the Ob' and Lena, which were built in the Netherlands, and several Finnish-built icebreakers. The largest icebreaker in the world -- the atomic-powered Lenin, 40,000 horsepower -- was launched in 1957 and is scheduled for Northern Sea Route operations in 1959. In addition, more diesel-electric icebreaker-cargo ships of the Lena class are planned, and 2 icebreakers of 22,000 horsepower are to be constructed in Finland.

Efforts to extend the length of the navigation season on the Northern Sea Route have been made ever since its inception as an established transportation route. In 1957, a hydrographic expedition was sent to Severnaya Zemlya to plot a northern variant of the Northern Sea Route through Proliv Krasnaya Armiya. This route was first planned in the late 1930's to parallel and serve as an alternate to the existing route. Several new methods have been developed to supplement the present vast program of aerial ice reconnaissance. Automatic weather stations are established on the pack ice and relay weather information to mainland polar stations. Experiments have been conducted on accelerating the rate of melting of pack-ice by covering it with coal and slag dust. On a trial basis, television cameras have been installed in reconnaissance aircraft to relay information on ice conditions directly to icebreakers and other ships in convoys.

According to a statement made by Burkhanov, at the Arctic Conference held in Stockholm in May 1956, freight can be transported by ship from Murmansk to Vladivostok at one-half the cost and in half the time required by rail transport. He further stated that the navigation is now open for 3 months, and added "We are assigned the task of extending this season to 6 months and by God, we will do it."

Item 5 (a). The continuing development of the Northern Sea Route has both stimulated and facilitated the establishment and supply of an increasing number of Arctic research installations. Soviet Arctic research and development is actively supported by 34 known scientific organizations (listed below). Of these the Chief Directorate of the Northern Sea Route is the largest single organization concerned with the Arctic effort. Its staff is estimated at 35,000 workers, of which 800 to 1,500 operate the nearly 100 Polar Stations and 500 are staff members of the Arctic Scientific Research Institute (see Map 2). The annual budget of the Arctic Scientific Research Institute is 30 million rubles, two-thirds of which is allotted for expeditions (5 large and 20 small expeditions per year).

The organizations concerned with Arctic research and development are as follows:

A. Chief Directorate of the Northern Sea Route (GUSMP)
   1. Arctic Scientific Research Institute

B. Academy of Sciences USSR
   1. Botanical Institute im. V. L. Komarova
   2. Committee on Problems of the North
   3. Institute of Geography
   4. Institute of Geology
   5. Institute of Microbiology
   6. Institute of Oceanology
   7. Institute of Permafrost Studies im. V. A. Obrucheva
   8. Institute of Physics of the Atmosphere
   9. Institute of Physics of the Earth
   10. Joint Committee for the International Geophysical Year
   11. Marine Hydrophysics Institute
   12. Murmansk Biological Station
   13. Zoological Institute

C. Chief Directorate of the Hydrometeorological Service, USSR
   1. Central Aerological Observatory
   2. Central Institute of Forecasting
   3. Main Geophysical Observatory
   4. State Oceanographic Institute

D. Ministry of Geology and Conservation of Mineral Resources, USSR
   1. All-Union Geological Research Institute
   2. Scientific Research Institute for Arctic Geology

E. Ministry of Fishing Industry
   1. Polar Scientific Research Institute for Marine Fisheries and Oceanography

F. Ministry of Communications, USSR
   1. Scientific Research Institute of Terrestrial Magnetism, Ionosphere, and Radiowave Propagation

G. Ministry of Agriculture, RSFSR
   1. Research Institute of Agriculture of the Far North

H. Academy of Medical Sciences, USSR

I. Leningrad University

J. Moscow University

K. Other Organizations
1. All-Union Scientific Research Institute of Transport Construction
2. Airport Scientific Research Station, Red Air Force
3. Dal'stroy, Department of Permafrost Studies, VNII-I
4. Institute NII-100
5. Noril'skiy Mining and Metallurgical Combinat
6. Scientific Research Institute of Foundation and Underground Construction, Academy of Construction and Architecture, USSR
7. Siberian Branch, Academy of Sciences, USSR
8. Vorkuta Coal Combinat

Item 5 (b) and (c). The population of the Soviet Arctic (north of 60°N) is estimated to exceed 4.5 million. Of this total, approximately 65 percent is in the European Arctic and 35 percent in the Siberian Arctic. The phenomenal growth of sizable urban-type settlements throughout the Soviet Arctic has closely paralled the intensified scientific, economic, and strategic developments since World War II.

5 (c). Currently, 29 cities have populations in excess of 10,000. Of this total, 6 have 50,000 to 100,000, 1 has 100,000 to 150,000, and 3 have populations larger than 150,000 (see Map 2).

The large urban centers in the European Arctic, such as Murmansk and Arkhangel'sk, are well known for their naval, industrial, commercial, and administrative functions. A prime example of recent urban development in the Siberian Arctic is Noril'sk. Established as a small mining settlement in the mid 1930's, Noril'sk has become the largest mining and metallurgical complex in the Soviet Arctic, supplying approximately 33 percent of the nickel produced in the Soviet Union, nearly 20 percent of the cobalt, and 10 to 15 percent of the copper.

Although the lines of communication of a number of Soviet Arctic settlements are still oriented southward, the increasing capabilities of the Northern Sea Route as a major shipping and naval route have contributed substantially to Arctic regional integration.

Population of the Soviet Arctic (north of 60°N) by Political-Administrative unit and by city.

Murmanskaya Oblast'	500,000
Murmansk	170,000
Monchegorsk	30,000
Kirovsk	35,000
Kandalaksha	35,000

Arkhangel'skaya Oblast'		1,205,000
Arkhangel'sk	238,000	
Severodvinsk	68,000	
Amderma	10,000	
Onega	10,000	
Nar'yan Mar	10,000	
Konosha	10,000	
Karel'skaya ASSR		615,000
Petrozavodsk	118,000	
Sortavala	20,000	
Medvezh'egorsk	18,000	
Belomorsk	15,000	
Kondopoga	14,000	
Kem'	10,000	
Komi ASSR		670,000
Vorkuta	60,000	
Syktyvkar	51,000	
Kotlas	55,000	
Tyumenskaya Oblast'		200,000
Salekhard	18,000	
Khanty-Mansiysk	20,000	
Krasnoyarsk Kray		500,000
Noril'sk	150,000	
Dudinka	20,000	
Igarka	30,000	
Yakutskaya ASSR		550,000
Yakutsk	70,000	
Tiksi	10,000	
Magadanskaya Oblast'		350,000
Magadan	65,000	
Anadyr'	10,000	
Pevek	10,000	

Item 5 (d). Railroad transportation in the Soviet Arctic, though comparatively recent, is already contributing significantly to the economic and military potential of the region. The penetration of key railroad lines into both European and West Siberian Arctic has supported the exploitation of mineral resources and the development of port facilities and airfields (see Map 1).

Existing railroad facilities include:

1. The double-track Leningrad-Murmansk trunkline
   a. Murmansk-Pechenga branchline
   b. Pinozero-Kovdor branchline
   c. Ruchi Karel'skiye-Alakurti-Salla branchline

2. The double-track Vologda-Arkhangel'sk trunkline
   a. Arkhangel'sk-Severodvinsk branchline

3. The Kotlas-Vorkuta trunkline, currently in the process of being double-tracked
   a. Vorkuta-Khal'mer-yu branchline
   b. Seyda-Labytnangi (Salekhard) branchline

4. Single-track Salekhard-Igarka line (believed to have been abandoned)

5. Dudinka-Noril'sk line, recently converted to broad-gauge and currently in process of electrification.

Railroads under construction or planned:

1. Rudnichnyy-Syktyvkar-Mezen'

2. Khal'mer-yu-Kara-Amderma-Khabarovo

3. Polunochnoye-Podgornaya

4. Achinsk-Yeniseysk-Yermakovo

5. Igarka-Dudinka

6. Tyndinskiy-Yakutsk-Oymyakon-Magadan

Item 6. Airfields in the Soviet Arctic have increased from a few sod strips concentrated in the European North to a network of air bases with hard surfaced runways that stretches across the entire Arctic region. After World War II, as a result of renewed economic development and increased military significance of the north, the USSR embarked on a vast program to expand its Arctic air facilities. This program is still in operation. At present the Soviet Union has approximately 200 airfields and seaplane stations north of 60° latitude. The majority of the airfields have natural-surfaced airstrips 2,500 to 5,000 feet in length. However 50 have runways 5,000 feet or more in length, and 57 have runways with permanent surfaces of concrete, asphalt, or tar-macadam (see Map 1).

Four airfields within the Soviet Arctic have runways exceeding 10,000 feet in length. The Mys Molotova airstrip at the northern tip of Severnaya Zemlya is 14,500 feet long and has a temporary surface of planking or other material. Anadyr/Leninka in the Soviet Far East has a permanent-surfaced runway 13,000 feet long. Tiksi West -- a new airport and the second located at this important port on the Northern Sea Route -- has a permanent-surfaced runway 10,500 feet in length.

The airfield nearest to North America (at 81°N latitude), is located on Ostrov Gofmana in Zemlya Frantsa-Iosifa and has a 10,000-foot runway. In addition to these facilities, ice landing strips are made at several locations for temporary use during the winter.

Seaplanes at one time were widely used during the summer to reach areas where landing strips were not available. To a large extent, helicopters have replaced seaplanes and are used for short flights to remote areas in both summer and winter.

The Soviets have made a concerted effort to develop and maintain their vast network of airfields in the Arctic. Problems of construction, maintenance, and supply have been studied, and methods to overcome them have been developed. Gravel pads and other techniques have been perfected for insulating the permafrost in order to stabilize runway surfaces. Maintenance difficulties -- including drainage of surrounding terrain and snow compaction or removal on runways -- have been successfully overcome. Rollers to pack the snow and foam machines to produce a roughened surface are used in areas where temperatures usually remain below freezing and thaws are infrequent. In more southerly areas where thaw periods are frequent, snow is removed with rotary snow plows and brushes, snow drags, bulldozers, and graders.

Most airfields are supplied by freighters and tankers during the short summer navigation season. Airfields that cannot be reached by sea because of severe ice conditions in a given year are serviced the following year or are supplied by air.

Item 7. Surveying, mapping and charting in the Soviet Arctic are also activities of major significance. Although a number of Soviet organizations are engaged in the mapping and charting of Arctic areas and waters, the principal organizations are:

A. The Arctic Scientific Research Institute of the Chief Directorate of the Northern Sea Route. The Institute in the prewar period had a Geodesy Department and a Cartographic Section, which in 1936 employed 60 to 70 topographers, astronomers, and geodesists.

B. Hydrographic Administration of the Chief Directorate of the Northern Sea Route.

C. Chief Directorate of Geodesy and Cartography and the Military Topographic Administration of the General Staff, which undertakes continental Arctic surveying and mapping.

Soviet activities in the mapping and charting of the Arctic coastal areas and seas is known to have been well underway in the middle 1930's. Activities ranged along the entire coast eastward to the Chukotsk Peninsula. At about this same date, a first-order triangulation arc from Khabarovsk northeastward along the Okhotsk Sea to the Bering Strait was undertaken for the explicit purpose of effecting a tie with U.S. Alaskan triangulation. During the pre-World War II period, however, the Soviet Arctic coastal triangulation consisted of a number of isolated systems based on local datums. An outstanding Soviet national requirement, therefore, was the connection of the coastal triangulations with the national net.

Progress on this problem began with the extension of first-order triangulation along the major river valleys (Yenisey, Lena, Ob', etc.) and with the Okhotsk Sea Arc. Progress during the prewar period was limited by the difficulties of Arctic environmental conditions which (1) made surveying expensive and (2) made attainment of first-order accuracies impossible under standard operational procedures. Sometime after World War II, it was learned that the Soviets improved their capabilities to achieve first-order accuracies. This fact was borne out by a Soviet disclosure of plans to extend 6 meridional chains of triangulation for the establishment of astronomical and gravity stations spaced 40 to 50 kilometers apart. These chains terminate at Murmansk, Archangel'sk, Vorkuta, Salekhard, Dudinka and Tiksi, respectively. If we assume, as is quite likely, that the Okhotsk Sea Arc has been completed to the Bering Strait, then the Soviets have or are in the final stages of connecting their Arctic triangulation schemes with the national network. This connection will permit the establishment of first-order geodetic control for long-range-missile launching sites located anywhere in the USSR, including the Arctic points nearest to the Western Hemisphere. Another significant Soviet achievement that also points to their Arctic capabilities is the completion of the 1:100,000 mapping of the entire USSR.

Further contributions to future Soviet missile-targeting capabilities are expected from Soviet gravity surveys in the Polar Basin. Between 1935 and 1945 -- well before the 1950 expansion of Soviet Polar Basin activities -- the Soviets established 302 gravity values in the area north of 70°N. It is known that gravity observations were a part of the 1950 drifting station program. Since these data have been explicitly withheld, the Soviet Union now has a more representative concept of geoidal undulations in the Arctic than has the West. With this information the Soviets are able to convert astronomic positions on the Polar ice-cap to geodetic positions as a result of their ability to correct errors due to the deflections of the vertical. Moreover, the knowledge of the gravity field throughout the Polar Basin will be useful to the improvement of mid-course guidance along polar trajectories.

Other indications of Soviet Arctic accomplishments are indicated by the following:

A. "Blank areas" in the Polar Basin were reduced by exploration to 17 percent (1945). By 1954, explorations covered 5,000,000 square kilometers, and observations were made at more than 200 points on the pack-ice.

B. Deep-water oceanological soundings made between 1918 and 1943 totalled 7,505 in the 4 Arctic seas.

C. Magnetic observations made between 1933 and 1945 totalled 2,226.

D. Chemical studies of Arctic waters, of which the Kara Sea has been most intensively studied, included (to 1948) the following observations:

(1) 10,000 for oxygen content; (2) 12,000 for alkalinity, and (3) more than 4,000 for hydrogen-ion concentration.